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**Cohen et al.**(10) **Pub. No.: US 2014/0122830 A1**(43) **Pub. Date: May 1, 2014**(54) **OPERATIONAL EFFICIENCY OF VIRTUAL  
TLBS****Publication Classification**(71) Applicant: **Microsoft Corporation**, Redmond, WA  
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**G06F 12/10** (2006.01)(72) Inventors: **Ernest S. Cohen**, Wyncote, PA (US);  
**John Te-Jui Sheu**, Redmond, WA (US);  
**Landy Wang**, Redmond, WA (US);  
**Matthew D. Hendel**, Seattle, WA (US);  
**Rene Antonio Vega**, Kirkland, WA (US);  
**Sharvil A. Nanavati**, Dundas (CA)(52) **U.S. Cl.**  
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USPC ..... **711/207**(73) Assignee: **Microsoft Corporation**, Redmond, WA  
(US)(57) **ABSTRACT**(21) Appl. No.: **14/139,809**

Various mechanisms are disclosed for improving the operational efficiency of a virtual translation look-aside buffer (TLB) in a virtual machine environment. For example, one mechanism fills in entries in a shadow page table (SPT) and additionally, speculatively fills in other entries in the SPT based on various heuristics. Another mechanism allows virtual TLBs (translation look-aside buffers) to cache partial walks in a guest page table tree. Still another mechanism allows for dynamic resizing of the virtual TLB to optimize for run-time characteristics of active workloads. Still another mechanism allows virtual machine monitors (VMMs) to support legacy and enlightened modes of virtual TLB operation. Finally, another mechanism allows the VMM to remove only the stale entries in SPTs when linking or switching address spaces. All these mechanisms, together or in part, increase the operational efficiency of the virtual TLB.

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